Asian Academy of Management Journal, Vol. 16, No. 2, 53–75, July 2011

A FRAMEWORK FOR CLASSIFYING MISFITS BETWEEN ENTERPRISE RESOURCE PLANNING (ERP) SYSTEMS AND BUSINESS STRATEGIES

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ABSTRACT

Enterprise resource planning (ERP) is a broad set of activities that is supported by multi-module application software that helps manufacturers or other businesses manage their activities. ERP is more than a software package; it includes the efforts and activities to integrate internal and external management information, business process automation and reengineering, and organisation structure streamlining. Thus, ERP eventually leads to an efficient and competitive business. Despite the prominence of ERP systems, approximately three-quarters of ERP projects are deemed as failures. Most failures are attributed to the misfit between pre-loaded business models in the ERP system and business requirements in the real world. This paper introduces a framework to classify ERP misfits into logical categories that provide insights for solution derivation. Subsequently, the classification methods are applied to a case study. Practitioners can use the misfit classification method to derive corresponding actions as solutions for ERP misfits based on their nature or specificity. In addition, the theoretical contribution of the ERP misfit problem is explored to provide information for researchers to determine appropriate theories and concepts explaining this domain.

Keywords: enterprise resource planning (ERP), business strategies and processes, misfits, misalignment, ERP implementation problems, business information system

INTRODUCTION

Most businesses realise that their use of isolated systems is limited; more sophisticated systems are needed to solve problems of handling and disseminating complex information, automating or optimising business processes, avoiding data duplication, and utilising data. The need for a single integrated system is widely appreciated (Olsen & Sætre, 2007). The past decade has seen the development of a "single integrated system", moving away from in-house developed software systems toward packaged systems that are not primarily developed or tailored for a single organisation. The most pervasive among these

systems are *enterprise resource planning* (ERP) systems. An ERP system is narrowly defined as a configurable software package that provides integrated transaction processing that spans across various business functional areas by consolidating all business operations into a uniform system environment. Moreover, ERP encompasses the entire effort to integrate management information from internal and external sources, business structure streamlining, and seamless coordination among various business functional areas.

Developing and implementing an ERP system is a major project requiring a significant level of resources, commitment and changes throughout the organisation. Often, an ERP implementation project is the single biggest project that an organisation undertakes. Despite invested efforts and resources, scholars assert that more than half of ERP projects have been judged as either unsuccessful or not having achieved expectations. Numerous failed cases have induced fatal disasters that have led to the demise of some companies (Moon, 2007). Common problems in adopting ERP systems are widely recognised to be rooted in the poor fit between ERP systems and business processes (Chen, H. H, Road, & Chen, S. C., 2009; Holsapple, Wang, & Wu, 2006; Hong & Kim, 2002).

This paper aims to determine how the poor fit between ERP systems and businesses develops. Studies have shown that an ERP system is not merely a software package. ERP alters the organisational infrastructure that affects how people work. Davenport (1998, p. 122) has argued that "an enterprise system, by its very nature, imposes its own logic on a company's strategy, organisation and culture". For example, SAP R/3, a major ERP vendor, currently stores more than 1,000 predefined processes that represent financial, logistics, and human resources best practices in a repository called "business engineer" (Shehab, Sharp, Supramaniam, & Spedding, 2004). In short, organisations are forced to align their work processes with those allowed by and encapsulated in the ERP systems (Holsapple et al., 2006).

Consistent with the aforementioned assertion, Gattiker and Goodhue (2002) postulated that when an enterprise chooses an ERP package, it accepts a particular set of limitations to business practices that it may conduct. Moreover, most ERP software vendors make assumptions about management philosophy and business practices. Therefore, most ERP packages seldom meet the precise needs and existing processes of the implementing organisation, and a misfit between the ERP system and business practices occurs (Holsapple et al., 2006). In addition, studies have suggested that the "poor fitness between ERP systems and businesses" issue may be worse in Asia because business models that underlie most ERP packages reflect only European or U.S. industry practices (Soh, Kien, & Tay-Yap, 2000).

This paper discusses various problems caused by misfits between ERP systems and businesses through a comprehensive and in-depth review of the literature. Based on the literature reviews, this paper suggests that many studies have investigated misfit-related issues of ERP systems in various contexts. These issues share certain similarities and can be rationally classified into appropriate categories. Hence, a framework is proposed to classify misfit problems, and to act as a foundation to explore, identify, categorise and analyse the problems in a systematic and intuitive manner.

This paper first presents the terms used in this paper and the literature review of various related works. Next, a framework for ERP misfit categorisation is proposed and discussed. Then the deployment of the proposed framework into a case study are discussed. This section also describes the methods used, the case company profile, and the case study findings. Lastly, discussion of the data and the framework is included.

LITERATURE REVIEW

ERP Systems

ERP systems have many definitions and have no universally accepted meaning. Although definitions vary in their orientation from a technical view to a holistic business perspective, the definitions do not contain any major variations. Fundamentally, scholars view the ERP system in four aspects, as shown in Table 1.

Table 1
Definitions of ERP systems from four perspectives

Business Process Perspective	Technological/Technical Perspective
ERP system as an instrument enabling enterprises to manage and streamline business processes through cross-functional or cross-organisational integration	ERP system as a configurable, online real-time interactive software package, which comprises multiple modules (or applications) to support the information processing function across the entire enterprise, through a single database and a uniform operating platform
Communication Perspective	Functionality Perspective
ERP systems as an enterprise-wide information system that integrates all information flows and provides access to real-time information	ERP systems as an integrated set of programs that automate various business procedures

Source: Modified from Yan, Rahmati, & Lee (2008)

From the technological perspective, ERP systems can be described as configurable software packages that seek to integrate the complete range of business processes and functions to present a holistic view of the business from a single IT architecture (Calisir, F. & Calisir, F., 2004). The main business functions integrated under a single ERP system can include supply chain management, inventory control, manufacturing scheduling and production, sales support, customer relationship management, financial and cost accounting, human resources, and almost any other data-oriented management process (Guttridge, Dani, & Burns, 2008; Moon, 2007; Wang, Klein, & Jiang, 2006).

The term "configurable software package" implies that the user enterprise could tailor the software to meet specific business requirements during the ERP configuration process. By manipulating configuration parameters, the firm models its business processes (the most detailed or lowest level of business strategy). Therefore, configuring an ERP system entails choosing among "pre-packaged" process options embedded within the software package (Olsen & Sætre, 2007). Thus, the configuration process is referred to as a functionality selection process that constrains the manner in which business processes can be conducted by the organisation (Gattiker & Goodhue, 2002; Davenport, 1998). Even with this flexibility, an organisation will find it mostly impossible to configure an ERP system to fit its needs exactly.

In the current business environment, ERP systems have been described as not only the price of entry for running a business but also as the connection to other enterprises in a value chain or networked economy (Wu & Wang, 2006; Shehab et al., 2004). Other benefits of ERP systems are commonly viewed through operational performance, which is at a low level of an organisational hierarchy and includes better routine decision making, improved resource utilisation, customer satisfaction, reduced inventory levels, lead-time reduction, on-time shipment, and reduction in work in progress (Gribbins, Subramaniam, & Shaw, 2006; Leary, 2005; Gattiker & Goodhue, 2004; Shang & Seddon, 2000). In other words, ERP systems are adopted by enterprises to enhance operational efficiency and effectiveness, and to eventually gain a competitive advantage, but they are also adopted as a cost of entry to highly competitive industries.

Business Strategies and ERP Systems

This section discusses the various levels of business strategies that are commonly found in either enterprises or business entities. ERP-related decisions or issues at each level of business strategy are also discussed.

Business strategy is defined as a pattern of actions and resource allocations designed to achieve organisational goals. Business strategy is commonly divided

according to organisation levels, portrayed in Figure 1. The lower layer of strategies is derived from the broader strategies of upper levels. The level of detail increases, and the planning time frame decreases from the top to the bottom of the hierarchical levels (Pearce II & Robinson, 2009).

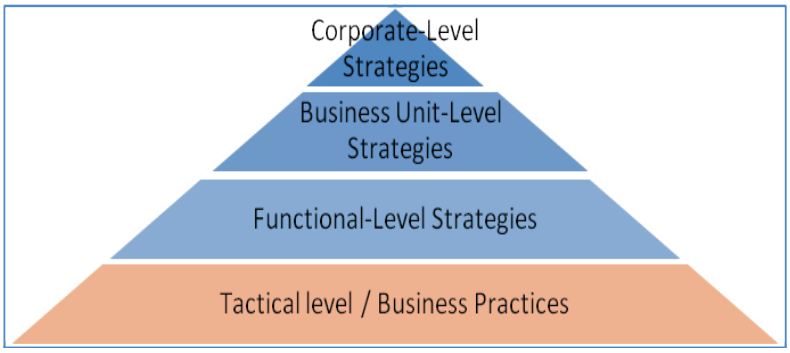

Figure 1. Hierarchical levels of strategy

At the highest level of the hierarchy is the corporate strategy. Corporate strategy identifies the set of business, markets, or industries in which the organisation competes and the distribution of resources among those businesses. The four fundamental corporate strategies are concentration, vertical integration, concentric diversification and conglomerate diversification (Pearce II & Robinson, 2009).

At the corporate level, ERP system-related decisions might involve whether the organisation should adopt a single ERP system for the entire corporation, an individual ERP system for each similar group of business units, or a distinctive ERP system for each business unit. However, ERP systems or certain modules of these systems may be more significant to certain business units than to others (Olsen & Sætre, 2007). In other words, configuring ERP systems at the corporate level (which is common practice) results in a particular ERP configuration being a good fit for certain sub-units, but also potentially a bad fit for other sub-units (Gattiker & Goodhue, 2004). Thus, trade-offs occur between having a single integrated system, which enhances communication flow, saves IT (Information Technology) costs, and eases maintenance, and having separate ERP systems with high fitness levels for an organisation's corresponding business units.

Business unit-level strategy is seated at the second level of the hierarchy. This involves major actions by which an organisation builds and strengthens its competitive position in the marketplace. Common strategies at this level comprise cost leadership, differentiation and agility (Pearce II & Robinson, 2009). Business units should ensure that selected ERP systems could either support or

align with business strategies. For instance, ERP solutions for companies with a cost-leadership strategy should support the operations mission (low-cost production), distinctive competence (superior process design) and objectives (efficiency, deliverability, quality and flexibility). In addition, long-term sales forecasting is critical for a cost leadership strategy (Koh & Saad, 2006). Furthermore, to achieve a high level of efficiency, ERP functionalities, such as costing, quotations, inquiry, availability check and delivery date determination are critical (Gupta & Kohli, 2006). Enterprises must first understand the requirements that need to be met to achieve their business goal and then match these requirements with appropriate ERP packages or configurations to support their business unit-level strategy.

At the third level of the hierarchy is the functional-level strategy, which involves strategies implemented by each functional area of the organisation to support the business unit-level strategy of the organisation. At this level, the ERP system-related decision faced by enterprises is to select modules for corresponding functional departments. Some enterprises choose "best-of-breed" modules from several ERP packages to support various functional departments. Other ERP system configuration methods aim to enhance the level of fitness between business requirements and the ERP systems, namely bolt-ons, screen masks, workflow programming and code modification (Brehm, Heinzl, & Markus, 2001).

Tactical-level and business practices (where all planning become actions) at the lowest level of the hierarchy are the most detailed business strategies, which is the focus when discussing the impact of ERP systems. Gattiker and Goodhue (2004) implied that examining the company level at which those processes are executed is important. At this level, the impact and misfits of ERP systems are incurred in the most detailed and objective manner within a considerably short time. This period is usually on a daily basis. This enables researchers to record the impact and misfit problems incurred objectively and in detail. Therefore, the focus of this paper is the business process level.

The terms "business practices" and "business processes" are used in this paper interchangeably to refer to business strategies at the lowest level of the strategy hierarchy. The following section discusses the misfit problems that occur due to the incompatibility between ERP systems and business strategies.

Misfit Problems between ERP Systems and Business Strategies

ERP is often viewed as a deterministic technology because enterprises are forced to undergo organisation-wide process re-engineering and change to be aligned with ERP systems. However, embedded business practices in ERP systems, called "best practices", are designated to meet the needs of broad classes of

businesses, rather than to specifically meet the particular needs of an individual business (Holsapple et al., 2006; Gattiker & Goodhue, 2004).

Most ERP software vendors make assumptions about management philosophy and business practices. IT and business managers argue that ERP vendors tend to have only one best-in-class application. For instance, PeopleSoft is linked with a good human resources module and Oracle with financials (Shehab et al., 2004). Apart from this, ERP systems are limited in the processes that they can model. For example, one estimate is that 20% of the legacy processes of a typical company cannot be modelled in SAP (Soh et al., 2000). Therefore, most ERP packages seldom meet the precise needs and existing processes of organisations. In addition, ERP systems are widely regarded as better suited in the batch-manufacturing context and tend to result in deficiency and disastrous problems in flow or continuous manufacturing.

Source of ERP misfits

According to Soh et al. (2000), ERP misfits arise from *enterprise-, industry-* or *country-specific requirements* that do not match the capabilities of the ERP package. Table 2 summarises the sources of ERP misfit problems.

Table 2
Sources of ERP misfit problems

Source of misfit	Description
Enterprise-specific requirement	Differences in the organisational structure, product and process, management practices
Industry-specific requirement	Industry regulations, standard practices
Country-specific requirement	Unique regulatory or social practices across nation or cultures

Source: Adapted from Soh et al. (2000)

Organisations operating in different countries tend to encounter different institutional pressures, and thus must comply with different sets of country-specific requirements. ERP packages are meant to support the processes of business entities. Thus, differences in national economic institutions should be considered. Implicit country-specific requirements, such as social practices or cultures, must be considered as well. Country-level differences need to be identified if the implementing organisation is from a different country. As the model preloaded in an ERP system does not fulfil these needs, this ERP misfit problem is caused by a country-specific requirement mismatch.

Professional and industry institutions are more likely to exert normative authority, for example, through guidelines on professional conduct and industry accreditation or recognition of organisations. To remain in good standing, organisations adopt forms and procedures appropriate to their type. The resource-based view (Barney, 1991) provides insight that industry boundaries and differences reflect, in part, the heterogeneity and immobility of some resource types. Differences in resource types will lead to differences in routines and structures for acquiring, deploying, maintaining, and disposing resources. An ERP developed in the context of industries with lower-value capital assets may not have the necessary routines and structures to support the processes of industries in which capital-asset cost is high. In the context of industry-specific requirements that are not met by the model preloaded in ERP systems, the issue becomes a source of the ERP misfit problem.

In contrast to impose structures that contribute to conformity across organisations, organisations also voluntarily acquire different structures that differentiate them over time from each other. Organisations are likely to acquire different structures for a variety of reasons. Soh and Sia (2004) mentioned that a major cause is different organisational experience and perceptions of routines associated with efficient resource acquisition and utilisation. Choices can vary from the level of competitive strategy to more operational routines. Organisations make strategic choices over time as they seek favourable positions within their environment. From a strategic perspective, the resource-based view theorises that such organisational differentiation is rooted in heterogeneous resource endowments (Mignerat & Rivard, 2009). Hence, organisations will evolve distinctive routines and structures to acquire and manage their strategic resources. When the model preloaded in ERP systems is either not compatible or conflicts with the enterprise-specific requirement, the ERP misfit problem arises from the enterprise-specific source.

Outcomes of ERP misfits

Due to misfit problems, enterprises may adjust their business ideas to the reference model of ERP systems, for example, to reduce the level of customisation to use the systems more efficiently. Thus, the overall aim of making the enterprises more competitive is compromised by the effort to make the ERP systems work (Olsen & Sætre, 2007). A potential consequence of this is that the competitive advantages of the enterprise may be compromised. This is especially true for businesses whose survival strategy is based on being innovative, flexible and unique as well as for those businesses whose competitive advantage comprises its core businesses. This description most accurately reflects the small- and medium-sized enterprises (SMEs), which comprise more than 80% of business settlements, in Malaysia (SMIDEC, 2005).

In other words, the capabilities of the ERP package limit the design of business processes. The organisation is accepting a particular set of limitations to business practices that it might conduct. Gattiker and Goodhue (2004) illustrated the constraints of ERP systems on business practices as shown in Figure 2.

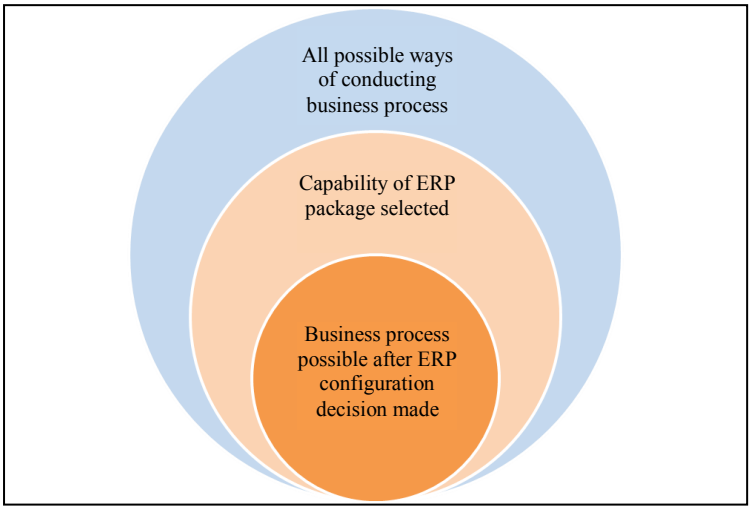

Figure 2. Constraints of ERP systems imposed on options of business process (Gattiker & Goodhue, 2004)

One commonly agreed issue is that a business must clearly understand its own strategy, processes, and policies in order to derive an effective ERP systems configuration. Unfortunately, most SMEs in developing countries inherently lack either a defined structure or formalised procedures that form the core efficiency for an ERP system. This does not affect day-to-day operations, but becomes important when a new computer system is chosen and installed (Olsen & Sætre, 2007). Hence, the authors have derived a proposition in which the misfit problems of ERP systems are more prevalent in smaller businesses compared with larger businesses, and in which most business strategy, processes, and policies are systematically defined and documented.

Relevant works

Other scholars have conducted studies on ERP misfits in different organisational contexts and adopted different methodologies. Table 3 presents the findings of previous research on ERP-related incompatibilities with business environments.

Table 3
ERP misfit from literature reviews

ERP Misfit Aspects	Scholars/Authors
Incompatible Input Data • The ERP systems failed to capture required object attributes (e.g., specifications of raw material) as input data to the systems • Result in deteriorated quality of input data (e.g., user bundles a group of similar materials under a single identifier)	(Wu, Shin, Wu, & Wan, 2005; Gattiker & Goodhue, 2004; Soh et al., 2000)
Poor Data Visibility • A consequence from the impact of deteriorated input quality • The data is bundled and not visible to users (e.g., undifferentiation of distinctive materials in the systems) • Impact subsequent information processing • Impact of poor information visibility is likely to trigger "chain-reaction" of ERP problems	(Gattiker & Goodhue, 2004)
Poor Data Accuracy • An implication of incompatible input data format and poor data visibility • Data kept in the ERP systems is not accurate and does not represent useful information for subsequent information processing	(Wu, Shin, & Heng, 2007; Gattiker & Goodhue, 2002)
Inappropriate Data Presentation and Output format • Reports generated by the ERP systems fail to provide the format or the data organisation that make the report meaningful or insightful in the context of users • Inflexibility of data output format: only minimal data manipulations are allowed, extensive programming skills are required to modify the systems to generate customized report.	(Chen et al., 2009; Holsapple et al., 2006; Wu et al., 2005; Soh et al., 2000)
Complexity of Reports and Interface • The report and interface of ERP systems are highly complex • Irrelevant or unnecessary data are displayed • Terms used in systems are different from terms normally used in the user organisation	(Hong & Kim, 2002)
Complexity and Poor Visibility of ERP Calculation and Logic • Logic behind the systems are not visible to end users • Users have difficulties understanding the calculation done by the system • Accuracy of output data is a question to users	(Gattiker & Goodhue, 2004, 2002)
Missing Validation Function • Poor or incomplete validation function that allows unauthorised access and alteration of data	(Soh et al., 2000)
Incompatible Skills of ERP Users • Poor user skills due to inadequate training program	(Gattiker & Goodhue, 2000)

(*continued*)

Table 3 (*continued*)

ERP Misfit Aspects	Scholars/Authors
Conflict with Management Philosophy and Organisational Structure • ERP systems inscribe modern management concepts and philosophy, highly structured process, data, and role • SMEs and organisation in developing countries potentially conflict with ERP systems	(Morton & Hu, 2008; Rajapakse & Seddon, 2005; Madapusi & Derrick, 2003)
Incompatible Business Model • ERP systems failed to model the operation processes or process flows of a user enterprise	(Gribbins et al., 2006; Das & Narasimhan, 2001)

PROPOSED FRAMEWORK

Previous findings imply that ERP misfit problems exhibit similarities although case studies are independent of each other and are conducted by different scholars in various regions. In other words, these ERP misfits could be organised systematically to enhance insight and interpretation. Hence, another purpose of this paper is to develop a framework to identify and classify the misfit problems of ERP systems. The constructed framework will provide the foundation to identify, analyse, manage and formulate solutions to such problems.

As illustrated in Figure 3, the framework has two parts. The first part conceptualises the sources of ERP misfits, and the second part conceptualises the impacts of different types of misfits.

The first portion of the framework is mainly derived from the study by Soh et al. (2000), which categorises misfits as the results of the following gaps:

1. Gaps between ERP systems and enterprise-specific requirements
2. Gaps between ERP systems and industry-specific requirements
3. Gaps between ERP systems and country-specific requirements

The descriptions and contents of each source of misfits have been discussed earlier (refer to pages). The problems or issues faced by users of the ERP systems have been observed and documented, and the problems or issues have been interpreted and decomposed into their basic elements. Subsequently, the researchers will identify whether the problems result from gaps between the requirements and the ERP system functionalities. Then, the researchers need to determine the group that the gap belongs to. Then, the researchers need to speak with relevant individuals and clarify doubts or obtain additional information for the decision making process.

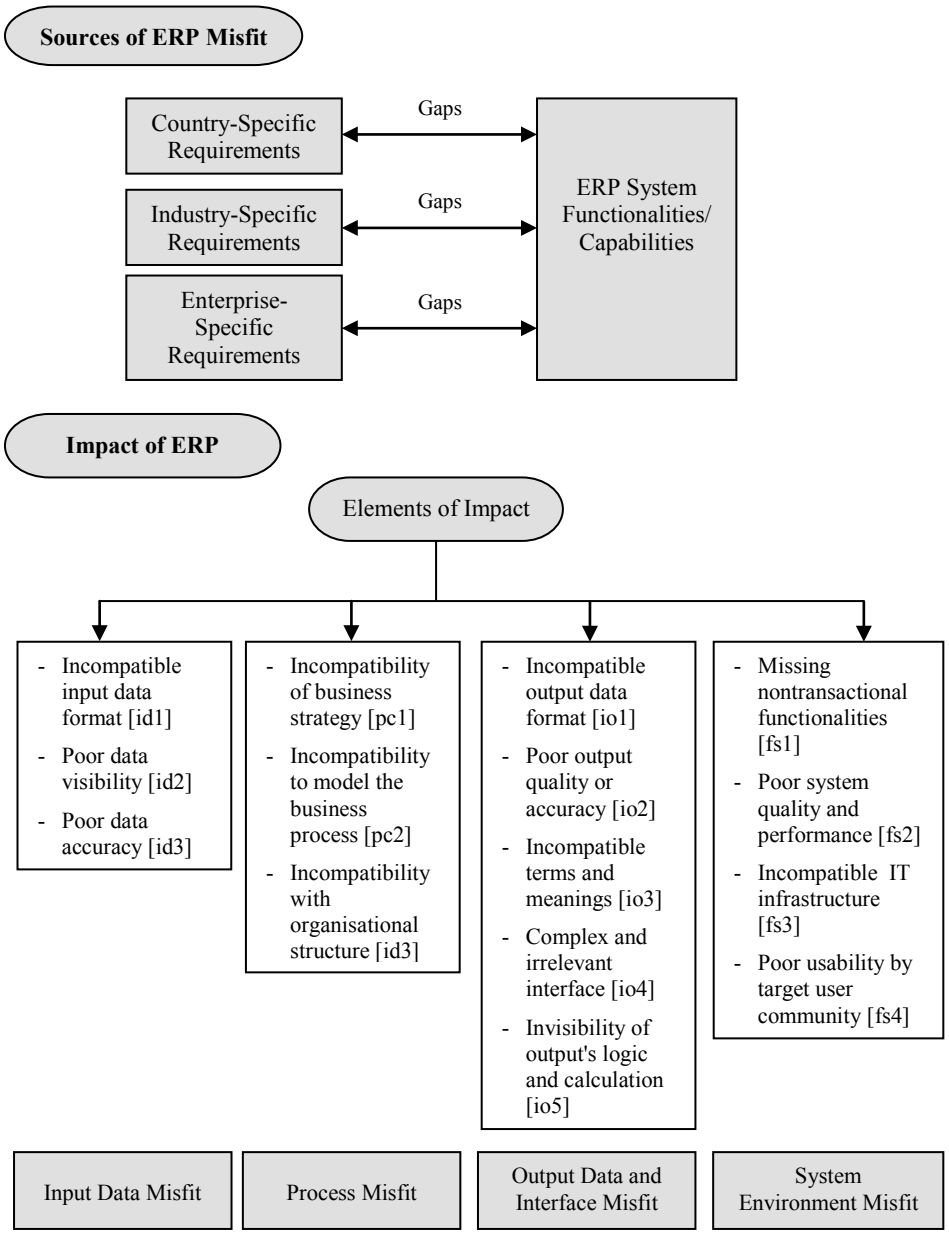

Figure 3. Framework for identifying and classifying ERP Misfits

The second part of the framework categorises the impact of ERP misfit into four main perspectives. These are *input data misfit*, *process misfit*, *output data and interface misfit*, and *non-business functionalities and system misfit.* The

categorisation of these ERP misfits is based on either traditional application software or a system perspective (input, process and output). This categorisation is well accepted, especially in analysing software and systems. Some ERP studies have adopted this categorisation method (Shiang-Yen, Idrus, & Yusof, 2010). As discussed previously, researchers need to decompose the ERP misfit problem into its most fundamental form, and subsequently determine which groups of impact it belongs to. The framework lists the dimensions of each group of ERP misfit impact. For instance, if the identified misfit is related to poor data accuracy, it belongs to the "input data misfit". The dimensions listed in the framework are the results of generalisation and summarisation from previous studies. ERP misfit studies were reviewed, and the most commonly used terms were identified to describe various types of ERP misfits. Duplicated, uncommon and less appropriate terms used to describe the same ERP misfit were filtered.

Input data misfit consists of problems that involve the incompatibility of ERP systems to capture various object attributes or documents into a database. *Process misfit* refers to the mismatch between functional requirements (business-related functionalities) of ERP systems and business requirements, such as the incapability of ERP systems to model the business process flow. However, *output data and interface misfit* comprises problems related to the output of ERP systems, such as the reports, the views and the interface. Lastly, *system environment misfit* involves system usability and IT infrastructure compatibility. This misfit involves the quality of ERP systems in the general information system context, such as security features, backup capability, reliability and flexibility. These misfits are often not scrutinised by other scholars but are believed to have a substantial impact on the success or failure of ERP system adoption.

APPLYING THE FRAMEWORK TO A CASE STUDY

Research Methodology

One of the main purposes of this paper is to evaluate the applicability of the proposed framework as a tool to identify and analyse misfit problems of ERP systems. To achieve this objective, a case study in a material management department at a manufacturing plant in Penang, Malaysia was conducted. Complete participation was performed to engage fully in the group activities under observation. The authors joined the company under an industrial attachment program. The observation being conducted was not explicitly declared. Although such an intention was implicitly known by the user groups, the role of the authors as industrial trainees was not sufficient to provide motivation or inducement to invoke the "Hawthorne effect" among the end users who were being observed. Key managers from procurement, inventory

management, receiving and shipping, quality assurance, and shop floor control were informally interviewed using open-ended questions. Direct observations were also conducted daily in the stated departments.

Observation is appropriate for the purpose of this paper because the paper is about understanding the routine rather than what appears to be abnormal. Bryman (1988) mentioned that observation helps avoid premature attempts to impose theories and concepts that may "exhibit a poor fit with the situation". This paper agrees with the anthropological perspective, which argues that to understand a situation, one must engage in an extended period of observation. Another rationale for using observation as a data collection method is that the authors wanted to avoid disrupting the routing of the subject. Thus, a realistic picture of the context can be observed and recorded.

One of the most common forms of anthropological fieldwork techniques used is cognitive anthropology. This technique seeks to understand how people perceive the world by examining how they communicate (Silverman, 1993). The observations conducted were not just limited to visual observation; listening to what ERP system users said was also important. Thus, informal interviews were conducted in a conversation-like manner. This allowed the interviewees to relax and be more comfortable about talking about the problems with the ERP system, which might be sensitive or unpleasant to disclose.

After three months of observation, the authors reorganised and summarised the reports to identify ERP misfits. These were then categorised using the proposed framework. Major misfit problems examined are listed in Future Work with the scenarios of the problem situation associated with the *category of misfit* and *dimension of misfit*.

Case Study Company

The observed company is a business unit of an electronic service provider located on the Penang Island of Malaysia. The company has established contract partners (customers) from distinct industries and product domains, such as medical devices, networking equipment, and computer hardware. It is a dedicated manufacturing centre that consists of self-contained functional areas, such as manufacturing, logistics, human resources and finance. By definition, the plant adopts "batch production", in which the equipment tends to be general and adaptable for various types of production. The plant has "engineer-to-order" (ETO) production systems in which the standard product range with the added availability of medications and customisations are offered. The company has adopted SAP R3 as its ERP system. Approximately 350 employees actively use their SAP accounts. The functional areas supported by this ERP package include

general office administration, logistics, manufacturing, accounting and human resources. In addition, the ERP system is connected to other corporation subsidiaries located around the globe, including the U.S., Singapore and China. There is no extension of the ERP system to customers, suppliers or sub-contractors.

Table 4
Profile of case company

Industry Group	Electrical and Electronics
Manufacturing	85% – batch production
Strategy	15% – flow production
Order Penetration Point	ETO
ERP System	SAP R3 with add-on functions developed in-house

Misfit Problems of the ERP Systems

This section discusses the misfit problems of the ERP system found in the observed company. All misfit problems examined and listed in Table 5 are clustered according to the proposed framework. Symbols, such as pc1, id2 and fs3, represent the dimensions of various misfit categories. The identified ERP problem scenario is associated with the corresponding misfit dimensions from the framework.

Table 5
Analysis of identified ERP misfits using the proposed framework

A.	Incapability of ERP system to capture dynamic business information
(I)	**Scenario**: Material vendors often allow the company to purchase materials at lower quantity (actual quantity may fluctuate) than the *minimum order quantity* (MOQ) officially quoted and recorded in the ERP system. MOQ is vital data for subsequent information processing such as creating purchase requisition in the ERP system. Since MOQ in the system does not truly reflect the lowest quantity of materials that can be purchased, purchasing officers have to convert purchase requisitions manually into open orders by asking from suppliers or referring to historical purchasing data.
(II)	**Source of Misfit**: Gaps between ERP system and industry-specific requirement
(III)	**Misfit Dimension(s)**: a) Poor data visibility [id2]– The system failed to maintain sufficient detailed data required by the company. b) Poor data accuracy [id3] – Should the company use the inaccurate MOQ in the ERP system to automate the purchasing process, this may increase operational expenses due to excessive inventory.
(IV)	**Impact of Misfit**: Input data misfit

(*continued*)

Table 5 (*continued*)

B.	ERP system imposes rigid procedure on work processes
(I)	**Scenario**: Delays between the physical movement of materials and update of corresponding information in the ERP system are common. This is because the authority to update the data is with a different group from those handling the execution. The discrepancy is intensified by the "batch processing" practice of updating data. A common situation encountered is that critical shipments are physically ready but the shipping department is not authorised to dispatch because shipment data is not ready in the ERP system.
(II)	**Source of Misfit**: Gaps between ERP system and enterprise-specific requirement
(III)	**Misfit Dimension(s)**: a) Incapability to model business process [pc2] – The ERP system is not flexible enough to cope with the dynamic and rapid work process requirements. From this perspective, the ERP system constrains the business process.
(IV)	**Impact of Misfit**: Process misfit
C.	ERP system not compatible with the decision-making structure
(I)	**Scenario**: Some decision making are not delegated to designated personnel because the company has limited user accounts with access to make decisions. Thus, personnel have to wait for the account to be unoccupied by other users to be able to log in and use the system. Alternately, decision-making authority is therefore given to the person who has the account.
(II)	**Source of Misfit**: Gaps between ERP system and enterprise-specific requirement
(III)	**Misfit Dimension(s)**: a) Incompatibility with organisational structure [pc3] – The decision-making process is not supported by the ERP system, requiring to process change to align with the system. This subsequently results in mediocre productivity and data integrity issues.
(IV)	**Impact of Misfit**: Process misfit
D.	Incapability of ERP system to generate customised report
(I)	**Scenario**: Users argued that the ERP system supports only minimal data manipulation. Extensive programming skills are required to modify the system and generate customised reports. To deal with the situation, users need to export the file to a spreadsheet format for further data manipulation. These files are manually stored in a local server. The detrimental impacts of such practice include shared files being vulnerable to unauthorised access and alterations, duplication, and deteriorating data integrity.
(II)	**Source of Misfit**: Gaps between ERP system and industry-specific requirement
(III)	**Misfit Dimension(s)**: a) Incompatible output data format [io1] – The format of the report generated from the ERP system could not satisfy the requirements of the company.
(IV)	**Impact of Misfit**: Data output misfit

(*continued*)

Table 5 (*continued*)

E.	Poor understanding of ERP system
(I)	**Scenario**: The company provided an on-the-job training program in which new hires are guided by assigned seniors in a non-structured manner or "ask if you have problems". Thus, new users have difficulties understanding the logic behind their actions and the system. In such cases, the users might not realise the true consequences of their input into the system and the implication on other downstream users.
(II)	**Source of Misfit**: Gaps between ERP system and enterprise-specific requirement
(III)	**Misfit Dimension(s)**: a) Poor usability by target user [fs4]
(IV)	**Impact of Misfit**: Non-business functionality and system misfit
F.	Poor integration capability of ERP system
(I)	**Scenario**: An executive manager argued that they have problems extending the ERP system to vendors. This is due to different systems adopted by vendors, making integration tedious and impossible in some cases. Enormous expenses often discourage integration although it is technically feasible. Thus, significant manual transmissions are required for daily business transactions. For example, reschedule reports are manually modified for legibility and are sent to every vendor through e-mail. On the vendor side, personnel have to fill in the reschedule report manually by referring to their own corresponding report.
(II)	**Source of Misfit**: Gaps between ERP system and enterprise-specific requirement
(III)	**Misfit Dimension(s)**: a) Poor system quality and performance [fs2] – Poor flexibility and integration capability of the ERP system b) Incompatible IT infrastructure [fs3] – Cross-organisational integration is hindered due to incompatibility of IT infrastructures between two organisations
(IV)	**Impact of Misfit**: Non-business functionality and system misfit

DISCUSSION

Most ERP misfits of the observed company are caused by gaps between the ERP system and the enterprise-specific requirement. Previous studies on enterprise systems support this finding (Sia & Soh, 2007). In other words, ERP system functionalities fail to support the requirements, structures, or policies that are unique to a particular company. This is expected and logical because ERP systems are developed to fulfil the general needs of businesses or manufacturers.

Based on the proposed framework, each ERP misfit has two properties, which are source and impact. These influence the organisational decision to resolve the ERP misfit.

Sources of ERP misfits, namely, enterprise-, industry-, and country-specific requirements, affect how an organisation resolves the ERP misfit problem. As misfit between ERP systems and industry- and country-specific requirements is imposed on the company (they did not voluntarily set up these requirements; regulations or professional associations specify the requirements), the company has no choice but to follow them. Therefore, the company is more likely to modify the ERP software package to either become supportive or to comply with the requirements. In this situation, both changing the requirements or maintaining non-compliance with the requirements are not desirable. For instance, tax-reporting structures that are built into the ERP systems do not fit the tax compliance requirements required by country regulations. Non-compliance often results in a violation of regulations or penalties. This might also adversely affect the sustainability of the organisation. These arguments are supported by the Institutional Theory, which distinguishes between two types of organisational structure, namely, imposed structure and voluntarily acquired structure (Mignerat & Rivard, 2009). The differences between the two structure types are important because they affect the degree of organisational freedom in terms of changing requirements. However, enterprise-specific requirements refer to those voluntarily adopted by the organisation. Thus, the freedom to alter these requirements is greater. The organisation can choose to adapt its requirements (by changing organisational process, strategies, or structure) to fit with the ERP systems as long as such alterations do not jeopardise the competitive advantage or strategic position of the organisation in the market.

The ERP misfit affects the decision to resolve the misfit from the perspectives of costs, technical difficulties and risk. These impacts are input misfit, process misfit, output misfit and system environment misfit. Input and process misfits occur at the core level of the system architecture, such as the data, application, and business logic levels. These entail higher costs of modification, greater risk, and complex processes because the core system layer, such as business logic, is intertwined with other modules. Any mistake will cause havoc in the ERP system. Furthermore, some ERP vendors prohibit their clients from accessing or modifying system source codes. In most cases, such modifications are discouraged, given that the ERP vendor might not be willing to provide supportive or maintenance services if anything goes wrong. Moreover, source code modification at the system core layer tends to make future maintenance or upgrade difficult. Official update patches from the vendor may no longer be compatible. Thus, input and process misfits are often resolved by altering the requirements (by changing business process, policies or structures), rather than modifying the ERP system. This is unless the benefit of modifying the ERP system is greater than the modification costs and all difficulties result from the system modification. In contrast, output and system environment misfits involve lower costs, less risks, and less complexity in modifications.

The resolving strategy for the ERP misfit should consider source and impact. Taking the first misfit identified in the case study, the misfit source is the gap between the system and industry-specific requirement, while the impact is categorised as an input misfit. Although modifying the system at the data level entails greater risk and cost, the case company has no choice but to comply with the industry requirements. This is imposed due to common practice in the industry. Nonetheless, the final misfit resolution strategy is often the result of complex decision processes, which involve other elements not covered by this paper, such as political power, social pressure, and financial resources. The proposed framework provides insights for managers to make decisions on misfit resolution, but not a deterministic answer to the misfit problem.

CONCLUSION

Implications of the Present Paper

The misfits identified in the case study can be appropriately categorised using the proposed framework built based on misfits identified in literature reviews. First, this implies the applicability of the proposed framework in categorising ERP misfits. Second, certain ERP misfits in the case study are similar to misfits found in previous studies conducted in other parts of the world. This implicitly indicates that some ERP misfits, especially process and output data misfits, are common despite differences in regions and industry groups. Nevertheless, the intensity of the misfits may differ in Western and Asian Countries as suggested by Soh et al. (2000).

From the perspective of managerial implications, unique organisational structures or processes might become obstacles in fully realising the benefit of ERP systems. This is especially true for SMEs with strategic advantages based on their uniqueness, flexibility, and low standardisation. Therefore, this paper allows business owners or managers to be better prepared in implementing ERP systems through advance awareness of the possible sources of ERP misfits.

In addition, this paper reveals the influence of two properties (sources and impact of ERP misfit) on the decision of managers to resolve the misfit. For instance, input and process misfits tend to entail complex and costly system modifications, because modification is needed at the deepest level of the system architecture. Moreover, modifications performed at the data and business logic levels are more likely to cause expensive maintenance and troublesome upgrade process in the future. An understanding of the influence of the ERP misfit allows managers to make informed decisions in solving the ERP misfit problem.

From the system vendor point of view, this paper shows that most ERP misfits occur at the business processes level. These are often encountered by end users rather than managers or directors in an organisation. Thus, involving end users of ERP systems into the requirement-engineering phase is important to produce realistic ERP systems.

Limitations of the Present Paper

Some limitations of the framework have been discovered when applied to the case study findings. The authors recognise that some ERP misfit problems may be the function of more than one dimension. Thus, ERP misfit problems should be decomposed into smaller and distinctive elements before categorisation. In addition, the framework does not clearly distinguish the initial stage of misfits and misfit-triggered problems. Misfit-triggered problems could be misunderstood as the impact of ERP misfits instead of being misfits themselves. A strict operational definition of ERP misfits should alleviate the problem. In summary, the framework should undergo further refinement to provide better and more systematic classification, leading to a comprehensive view of ERP misfit problems.

Contribution of the Present Paper

This paper contributes to both academicians and practitioners. In terms of the literature, the proposed framework provides a conceptual foundation to identify and categorise ERP misfits. Specific areas can be studied by scholars for in-depth research because ERP misfits are decomposed in an organised manner. From the practitioner perspective, the sources and categories of ERP misfits may imply that different solutions are needed to confront the problems. For instance, ERP misfits derived from gaps between nation-specific requirements and ERP systems may suggest that the user organisation should enhance the "locality" of the ERP system, perhaps by introducing ERP systems from local vendors.

Future Works

The authors derived a proposition that misfit problems are more intense in the context of SMEs, and future studies can investigate this further. Future works could also integrate this qualitative framework with other quantitative methods to measure the extent of ERP misfits and provide more comprehensive and insightful views about ERP misfits.

ACKNOWLEDGMENT

This work is supported by the Universiti Sains Malaysia (USM) Fellowships and the Universiti Sains Malaysia Research University Postgraduate Research Grant Scheme (USM-RU-RPGS Grant) No. 1001/PKOMP/833027.

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